SCHEDA CATALOGO

Scuola	Istituto Tecnico Industriale ”A. Malignani”
Titolo del modulo	The triangle: notable points
Autore	Prof. Graziella Nardi
Classe	Il modulo è stato implementato in una classe seconda dell’istituto tecnico industriale.
Livello Linguistico	Pre-Intermediate
Prerequisiti	Gli studenti devono conoscere i concetti di angolo, bisettrice, segmento, punto medio, congruenza, intersezione di rette. Devono aver già lavorato con il programma Cabrì (devono essere in grado di tracciare punti, segmenti, rette, rette perpendicolari, individuare punti, intersezioni tra oggetti, trascinare oggetti)
Obiettivi	Saper classificare i triangoli in base ai lati e agli angoli, saper definire circocentro, ortocentro, baricentro e incentro di un triangolo, conoscere la retta di Eulero.
Contenuti disciplinari	Classificazione dei triangoli in base ai lati e agli angoli. Definizioni di asse e di circocentro. Definizioni di altezza e di ortocentro. Definizioni di bisettrice e di incentro. Definizioni di mediana e di baricentro. Retta di Eulero.
Numero di ore	1 ora (da 50 minuti) per l’attività didattica 1 ora (da 60 minuti) per l’attività di laboratorio 30 minuti per il test finale 30 minuti per la sua correzione

Materiale	Fotocopie del materiale prodotto. (Fogli di lavoro per gli allievi)
Supporti	Lavagna. Laboratorio di informatica
Compresenza	A seconda della disponibilità del docente di L2.

LESSON PLAN

Il modulo si articola in 2 lezioni di 50 e 60 minuti, la seconda delle quali in laboratorio di informatica. Dopo questa seconda ora è previsto il test finale, di 30 minuti. Si prevede di dedicare 30 minuti circa alla correzione del test.
L'attività didattica è strutturata come segue:

Lezione 1:

- ***Presentazione dell'attività*** *(10 minuti circa)* ***(Lesson_1.doc)***
- ***Attività di sostegno alla comprensione*** *(10 minuti circa)*
  Glossario dei termini che riguardano i prerequisiti: quest'attività permette agli studenti di apprendere i termini specifici (microlingua) che descrivono enti geometrici già conosciuti e già studiati in italiano.
  Il glossario viene presentato agli studenti mediante fotocopie. I vari termini vengono letti e ripetuti affinché il loro significato risulti chiaro e venga utilizzato in modo preciso.
- ***Presentazione della classificazione dei triangoli e delle definizioni dei punti notevoli dei triangoli*** *(15 minuti circa)*
- ***Esercizi per verificare la comprensione e consolidare l'apprendimento*** *(15 minuti circa)*
  Si propone agli studenti un'attività di comprensione della microlingua: devono dimostrare di aver appreso il significato delle parole nuove e aver memorizzato i termini del glossario, viene loro richiesto di tracciare figure con caratteristiche precise.
  Tutti gli studenti devono completare sul proprio foglio le definizioni.

Lezione 2:

- ***Presentazione dell'attività*** *(5 minuti circa)* ***(Lesson_2.doc)***
- ***Ripasso delle nozioni apprese durante la prima lezione e consolidamento delle conoscenze*** *(30 minuti circa)*
  Ripasso dei termini incontrati nella prima lezione e costruzione guidata con Cabrì (con istruzioni in inglese) di triangoli e dei punti notevoli. Gli allievi vengono invitati ad osservare i grafici e a dedurre le caratteristiche dei punti notevoli.
  Contemporaneamente vengono proposte ai ragazzi delle domande cui devono rispondere in base alle osservazioni effettuate.
  Questo esercizio si presta al lavoro in coppia per favorire le deduzioni e il confronto..
- ***Costruzione della retta di Eulero*** *(20 minuti circa). Oltre alla costruzione guidata, i ragazzi dovranno rispondere ad alcune domande per dedurre infine alcune caratteristiche della retta.*

Test finale ***(30 minuti) (Final_Test.doc)***

La verifica finale comprende tre diverse tipologie di esercizi. Viene verificata la conoscenza dei termini, delle definizioni e delle relazioni tra gli elementi studiati.

THE TRIANGLE

LESSON 1

We want to improve our knowledge about one of the basic shapes of geometry: the triangle.
In particular, we will focus our attention on some particular points, lines and circles associated with a triangle. We will learn their properties. Remember to use English as much as possible!

PLAN OF THE ACTIVITY

Lesson 1: First we will introduce a basic glossary.
Then we will practice the new words by building definitions and we will do some exercises.

GLOSSARY

POINT	Punto
LENGTH	Lunghezza
ANGLE	Angolo
VERTEX	Vertice
SIDE	Lato
POLYGON	Poligono
RIGHT ANGLE	Angolo retto
ACUTE ANGLE	Angolo acuto
OBTUSE ANGLE	Angolo ottuso
MIDPOINT	Punto medio

TRIANGLES AND NOTABLE POINTS

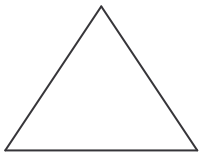
A triangle is one of the basic shapes of geometry: a polygon with three corners or vertices and three sides or edges which are line segments.

TYPES OF TRIANGLES

Triangles can be classified in two ways: by *sides* and by *angles.*

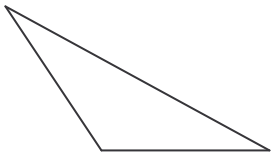
Classification by sides:

- In a **equilateral triangle**, all three sides are of the same length.
- In an **isosceles triangle**, two sides are of equal length. The sides that are the same length are called the legs. The other side is called the base.
- In a **scalene triangle**, all sides have different lengths.



Equilateral

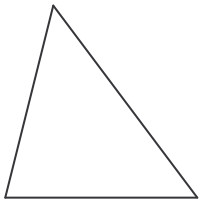
Isosceles



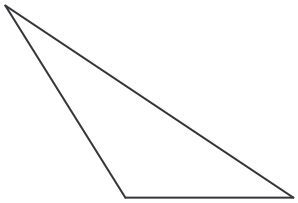
Scalene

Classified by angles

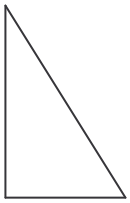
- An **acute triangle** has all angles measuring less than 90° (three acute angles).
- An **obtuse triangle** has one angle measuring more than 90° (an obtuse angle).
- A **right triangle** has one 90° internal angle (a right angle). The side opposite to the right angle is the hypotenuse; it is the longest side in the right triangle. The other two sides are the legs (or catheti) of the triangle.
- An **oblique triangle** has no internal angle equal to 90° (right angle). Obtuse triangles and acute triangles are oblique triangles.



Acute



Obtuse

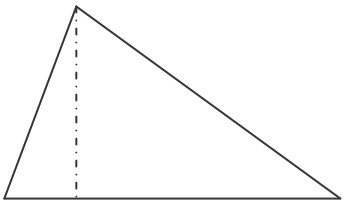


Right

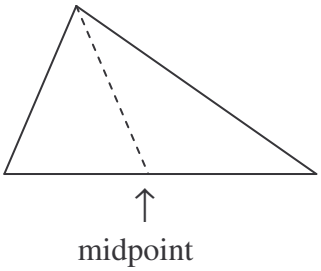
POINTS AND LINES ASSOCIATED WITH A TRIANGLE

Definitions.

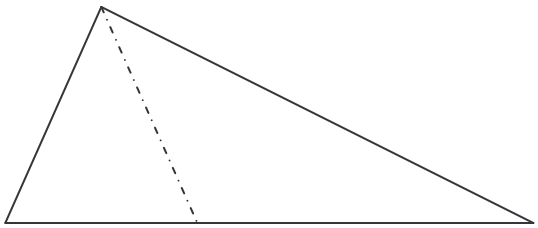
The **altitude** of a triangle is a line segment extending from any vertex of a triangle perpendicular to the line containing the opposite side.



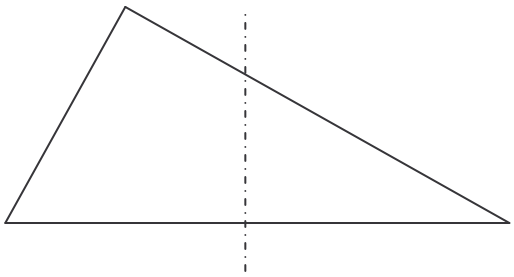
The **median** of a triangle is a line segment extending from any vertex of a triangle to the midpoint of the opposite side.



An **angle bisector** of a triangle is a line segment extending from any vertex of a triangle, and cutting the corresponding angle in half, to the opposite side.



A **perpendicular bisector** of a triangle is a straight line passing through the midpoint of a side, and being perpendicular to it.



The intersection of the altitudes is the **orthocenter**.

The intersection of the medians is the **centroid** .

The intersection of the angle bisectors is the **incenter.**

The intersection of the perpendicular bisectors is the **circumcenter**.

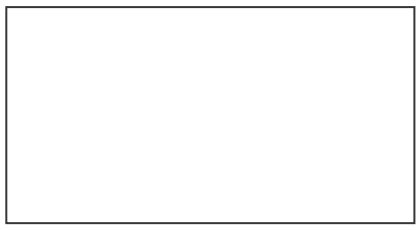
EXERCISES

1) Draw a triangle :

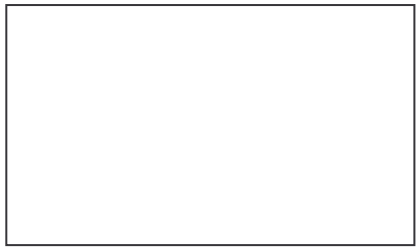
a) equilateral

b) right scalene

c) right isosceles

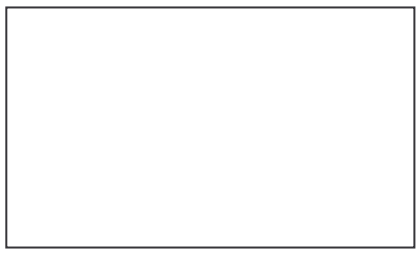


d) obtuse isosceles



e) acute scalene

f) acute isosceles



g) obtuse scalene

2) Complete:

a) An equilateral triangle has …….

b) An isosceles triangle has ……

c) A right triangle has ……

d) An angle bisector of a triangle is ……

e) An altitude of a triangle is ……..

f) The circumcenter of a triangle is ……

LESSON 2

PLAN OF THE ACTIVITY

Fist we will construct some triangles and we will explore altitudes, medians, perpendicular bisectors and angle bisectors of triangles; then we will explore properties of the four points of concurrency: orthocenter , centroid, circumcentre and incenter:
We will analyze the properties of the Euler Line.

1. Altitudes of a triangle and the orthocenter

- Construct a triangle with the *triangle* tool and label the vertices A, B and C.
- Construct one altitude in the triangle using the *perpendicular line* tool. Select one vertex and select the side opposite that vertex. With the *perpendicular line* tool still active, construct the other two altitudes of the triangle.
- See that the three altitudes of the triangle intersect each other at one point (called orthocenter).
- Using the *point>intersection* tool place a point at the intersection of the altitudes.

Drag a vertex of the triangle and answer the following questions:

1. What appears to be true about the three altitudes of the triangle?

2. In relation to the triangle, where is the orthocenter located (inside, outside or on the triangle)?

Acute triangle _____

Right triangle _____

Obtuse triangle _____

2. Medians and the centroid

- Construct a triangle with the *triangle* tool and label the vertices A, B and C.
- Construct the midpoints of all three sides of the triangle using the *midpoint* tool.
- Use the *segment* tool to connect each vertex to the midpoint of the opposite side.
- See that the three medians of the triangle intersect each other at one point (called centroid)
- Using the *point>intersection* tool place a point at the intersection of the medians.

Drag a vertex of the triangle and answer the following questions:

1. What appears to be true about the three medians of the triangle?

2. In relation to the triangle, where is the centroid located (inside, outside or on the triangle)?

Acute triangle _____

Right triangle _____

Obtuse triangle _____

3. The centroid divides each median into two unequal parts: the segment from the vertex and the centroid, and the segment from the centroid to the opposite side. To investigate the lengths of those two parts, use the *measure>distance and length* tool to measure these on one median.
Drag a vertex of the triangle and observe the lengths changing.
Record some measurements:

Distance from vertex to centroid	Distance from centroid to midpoint

Use the *calculate* tool to find the ratio of the two lengths.

What is the ratio of the two distances? _____

3. Perpendicular bisectors and the circumcenter

- Construct a triangle with the *triangle* tool and label the vertices A, B and C.
- Construct the perpendicular bisector of one side using the *perpendicular bisector* tool.
- With the *perpendicular bisector* tool still active, construct the perpendicular bisector of the other two sides of the triangle.
- See that the three perpendicular bisectors of the triangle intersect each other at one point (called circumcenter).
- Using the *point>intersection* tool place a point at the intersection of the perpendicular bisectors.

Drag a vertex of the triangle and answer the following questions:

1. What appears to be true about the three perpendicular bisectors of the triangle?

2. In relation to the triangle, where is the circumcenter located (inside, outside or on the triangle)?

Acute triangle _____

Right triangle _____

Obtuse triangle _____

4. Angle bisectors and the incenter

- Construct a triangle with the *triangle* tool and label the vertices A, B and C.
- Construct the angle bisector of one angle using the *angle bisector* tool.
- With the *angle bisector* tool still active, construct the angle bisector of the other two angles of the triangle.
- See that the three angle bisectors of the triangle intersect each other at one point (called incenter).
- Using the *point>intersection* tool place a point at the intersection of the angle bisectors.

Drag a vertex of the triangle and answer the following questions:

1. What appears to be true about the three angle bisectors?

2. In relation to the triangle, where is the incenter located (inside, outside or on the triangle)?

Acute triangle _____

Right triangle _____

Obtuse triangle _____

The Euler line

- Construct a triangle with the *triangle* tool and label the vertices A, B and C.
- Construct the circumcenter of the triangle and label it D. Hide the perpendicular bisectors using *hide/show* tool.
- Construct the centroid of the triangle and label it E. Hide the medians using the *hide/show* tool.
- Construct the orthocenter of the triangle and label it H. Hide the altitudes using the *hide/show* tool.

a) What do you notice about the relative positions of the points D, E and H?

_____

b) Construct a line (using *line* tool) through any two of the three centers to verify your answer. The circumcenter, the centroid and the orthocenter all lie on a single line: the Euler Line.

c) Drag any of the vertices of the triangle. What do you observe?

_____

d) Using *segment* tool, define segments $\overline{DE}, \overline{EH}$ and $\overline{DH}$; find their lengths using *distance and length* tool.

DE=_____ EH=_____ DH=_____

e) Calculate the following ratios using *calculate* tool

DE/EH=_____ DE/DH=_____

f) Drag any of the vertices of the triangle. What do you observe about the ratios DE/EH and DE/DH? _____

g) What observation can you make about the Euler Line when the triangle is isosceles? Equilateral?

_____

_____

FINAL TEST

NAME:_____ **DATE:**_____

Exercise 1: True or false:

1. An isosceles triangle has no congruent sides. . T F
2. A right triangle has one right angle T F
3. An equilateral triangle is always an acute triangle. T F
4. A right triangle is always a scalene triangle. T F
5. The median of a triangle is a line segment extending from any vertex and the opposite side. T F

Exercise 2: Fill in the gaps:

1. The altitudes of a triangle intersect in a single point, called ……..
2. A …… of a triangle is a segment joining any vertex to the midpoint of the opposite …….
3. The angle bisectors of a triangle intersect in a single point, called ……..
4. The medians of a triangle intersect in a single point, called ……..
5. A …….. bisector of a triangle is a straight line passing through the …….. of a side and being perpendicular to it.
6. An …… of a triangle is a segment from any vertex perpendicular to the line containing the……side.
7. The distance between a vertex and the centroid is ……as large as the distance between the ……. and the midpoint of the …… side.
8. The perpendicular ……. of a triangle intersect in a single point, called ……
9. The line upon which the circumcenter, ……, and orthocenter lie is called the ……..
10. The ……. is always located between the …….. and the ……..

Exercise 3: complete the following chart

Elements	Intersection point	Location of the point in relation to the triangle		
		Acute triangle	right triangle	obtuse triangle
Angle bisectors	……	…….	……	……
……..	centroid	…….	……	……
……..	……..	……..	Midpoint of the hypotenuse	……
Altitudes	……	…….	…….	……